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IS 4600 (1968): Flexible Shafts [PGD 31: Bolts, Nuts and Fasteners Accessories]

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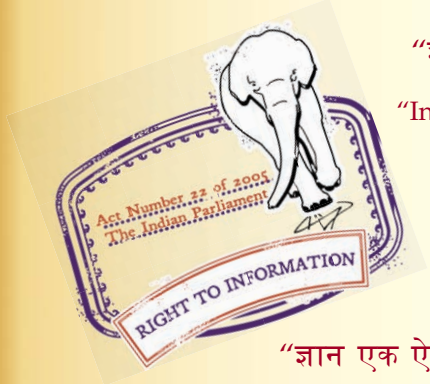

"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

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IS : 4600 - 1968

REAFFIRMED

1996

Indian Standard

SPECIFICATION FOR FLEXIBLE SHAFTS

First Reprint MAY 1977

(Incorporating Amendment No. 1)

UDC 621·824·5

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

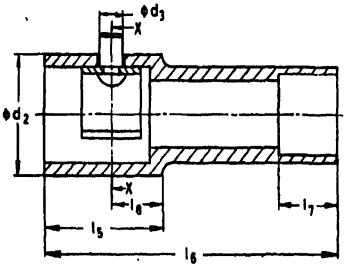
[redacted] Gr 8

June 1968

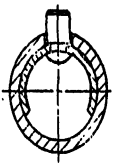
TABLE 1 DIMENSIONS OF TYPE A FLEXIBLE SHAFT ASSEMBLY AND PARTS

(*Clause* 4.1.1)

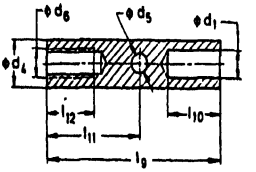
All dimensions in millimetres.



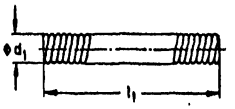
OUTER CASING END FITTING



SECTION XX

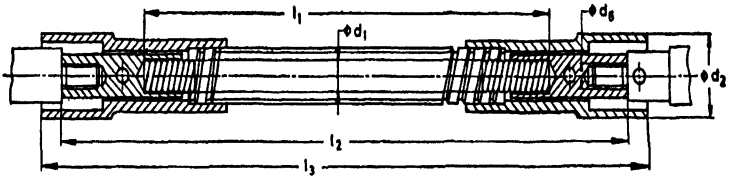


SHAFT END FITTING



INNER SHAFT

OUTER CASING



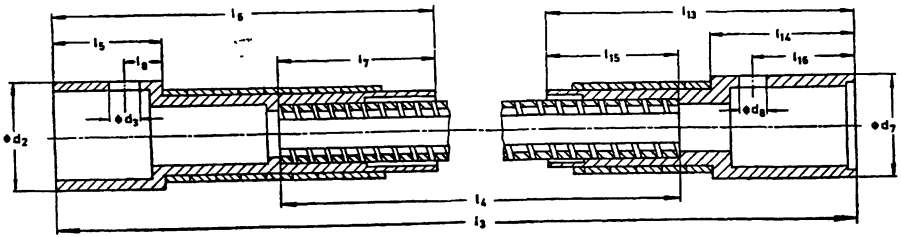
FLEXIBLE SHAFT ASSEMBLY

Sl No.	Designation	d_1	d_2	d_3	d_4	d_5	d_6	l_1	l_2	l_3	l_4	l_5	l_6	l_7	l_8	l_9	l_{10}	l_{11}	l_{12}
1	7 × 1 500	7	20	6	9	3	M 6	1 500	—	—	1 470	40	133	36	13	35	10	19	12
2	7 × 2 000	7	20	6	9	3	M 6	2 000	—	—	1 220	40	133	36	13	35	10	19	12
3	10 × 1 500	10	28	8	12	4·5	M 10	1 500	1 570	1 610	1 460	40	133	36	13	50	15	27	17
4	10 × 2 000	10	28	8	12	4·5	M 10	2 000	2 070	2 110	1 960	40	133	36	13	50	15	27	17
5	12 × 1 500	12	28	8	14	4·5	M 10	1 500	1 570	1 590	1 450	40	133	36	13	55	20	27	17
6	12 × 2 000	12	28	8	14	4·5	M 10	2 000	2 070	2 090	1 950	40	133	36	13	55	20	27	17
7	15 × 2 000	15	34	8	18	6·5	M 10	2 000	2 090	2 114	1 930	40	133	36	13	70	25	35	22
8	15 × 3 000	15	34	8	18	6·5	M 10	3 000	3 090	3 114	2 930	40	133	36	13	70	25	35	22
9	20 × 2 000	20	40	8	23	6·5	M 14	2 000	2 090	2 114	1 920	40	133	36	13	75	30	35	22
10	20 × 3 000	20	40	8	23	6·5	M 14	3 000	3 090	3 114	2 920	40	133	36	13	75	30	35	22

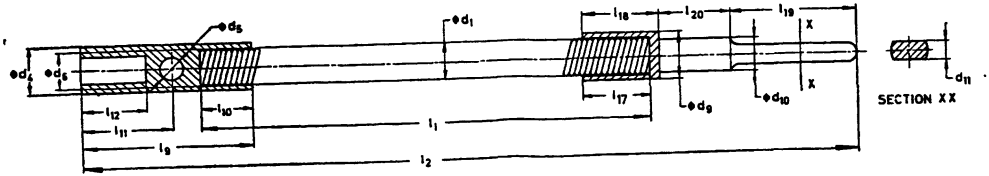
TABLE 2 DIMENSIONS FOR TYPE B FLEXIBLE SHAFT

(*Clause* 4.1.2)

All dimensions in millimetres.



OUTER CASING ASSEMBLY



INNER SHAFT ASSEMBLY

Designation	d_1	d_2	d_3	d_4	d_5	d_6	d_7	d_8	d_9	d_{10}	d_{11}	l_1	l_2	l_3	l_4	l_5	l_6	l_7	l_8	l_9	l_{10}	l_{11}	l_{12}	l_{13}	l_{14}	l_{15}	l_{16}	l_{17}	l_{18}	l_{19}	l_{20}
7 × 1 500	7	30	8	12·0	5	M 10	22	8	8·5	5·0	3·9	1 500	1 590	1 547	1 452	30	86	33	10	40	11	24	18	75	31	33	20	15	20	38	18
7 × 2 000	7	30	8	12·0	5	M 10	22	8	8·5	5·0	3·9	2 000	2 090	2 047	1 952	30	96	33	10	40	11	24	18	75	31	33	20	15	20	38	18
10 × 1 500	10	30	8	12·0	5	M 10	28	8	12·5	7·5	5·9	1 500	1 605	1 548	1 436	30	102	40	10	47	15	25	18	90	40	40	28	20	23	52	18
10 × 2 000	10	30	8	12·0	5	M 10	28	8	14·0	7·5	5·9	2 000	2 105	2 048	1 936	30	102	40	10	47	15	25	18	90	40	40	28	20	23	52	18
12 × 1 500	12	30	8	14·0	5	M 10	28	8	14·0	7·5	5·9	1 500	1 607	1 550	1 430	33	105	40	13	50	18	25	18	95	40	40	28	25	30	52	18
12 × 2 000	12	30	8	14·0	5	M 10	28	8	14·0	7·5	5·9	2 000	2 107	2 050	1 930	33	105	40	13	50	18	25	18	95	40	40	28	25	30	52	18
15 × 2 000	15	40	8	17·5	7	M 14	35	8	17·5	11·0	8·9	2 000	2 109	2 059	1 959	40	95	45	13	64	26	33	23	95	50	45	34	25	28	55	13
15 × 3 000	15	40	8	17·5	7	M 14	35	8	17·5	11·0	8·9	3 000	3 109	3 059	2 959	40	95	45	13	64	26	33	23	95	50	45	34	25	28	55	13
20 × 2 000	20	40	8	23·0	7	M 14	40	8	—	—	—	2 000	2 086	2 110	1 960	43	110	35	16	73	30	33	23	110	43	35	27	—	—	—	—
20 × 3 000	20	40	8	23·0	7	M 14	40	8	—	—	—	3 000	3 086	3 110	2 960	43	110	35	16	73	30	33	23	110	43	35	27	—	—	—	—

NOTE —The dimensions given for 20 mm shaft are for the type where the shaft has a threaded (fixed) connection at both sides and not sliding at the tool holder end.

(EDC 44)

Printed at New India Printing Press, Khurja, India

Indian Standard

SPECIFICATION FOR FLEXIBLE SHAFTS

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(*Continued from page* 1)

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Indian Standard

SPECIFICATION FOR FLEXIBLE SHAFTS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 15 May 1968, after the draft finalized by the Transmission Devices Sectional Committee had been approved by the Mechanical Engineering Division Council.

0.2 This standard has been prepared with a view to achieving uniformity in the manufacture and easy interchangeability of parts of flexible shafts.

0.3 Flexible shafts make it possible to transmit power or to provide remote control between any two points with a single self-contained element, regardless of the relative position of the two points or obstacles on the path between them.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

---

1. SCOPE

1.1 This standard covers the requirements and principal dimensions of flexible shafts for industrial purposes.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Inner Shaft — The bare working element without end fittings.

2.2 Shaft End Fittings — Parts for fastening to the ends of the inner shaft by means of which the flexible shaft assembly is connected to the driving and driven elements.

---

*Rules for rounding off numerical values (*revised*).

2.3 Inner Shaft Assembly — The inner shaft with end fittings attached or one with integrally formed squares.

2.4 Outer Casing — A flexible covering in the form of tube which acts as a runway or guide for the inner shaft, protects it from dirt and injury, assists in retaining lubrication and prevents formation of loops in operation.

2.5 Outer Casing End Fittings — Parts used for fastening to the ends of the outer casing, by means of which the outer casing is connected or coupled to the driving and driven elements (*see* Fig. 1).

2.6 Outer Casing Assembly — The outer casing with end fittings attached.

2.7 Flexible Shaft Assembly — A combination of inner shaft assembly and co-ordinated outer casing assembly. Practically all applications of the flexible shaft require a flexible shaft assembly.

2.8 End Stiffener — A member helically wound and slipped over either end of the outer casing to prevent excessive bend of the shaft near the ends.

2.9 Lay of the Shaft — The pitch direction of the outer layer of shaft. Depending upon the direction of lay, shaft shall be specified as right lay or left lay.

2.10 Direction of Rotation — The direction which tightens up the outer layer of the inner shaft.

3. MATERIALS AND MECHANICAL PROPERTIES

3.1 Inner Shaft — The inner shaft shall be made of spring steel according to IS:727-1964*.

3.2 Outer Casing — The outer casing shall have an inner liner of suitable steel having a minimum tensile strength of 120 kgf/mm^2 with rolled rounded edge.

4. DIMENSIONS

4.1 The dimensions of flexible shaft assembly and their parts shall be as given in Table 1 (*see* Fig. 1).

*Specification for hard drawn carbon steel wire for springs for general engineering purposes (*revised*). (Since withdrawn).

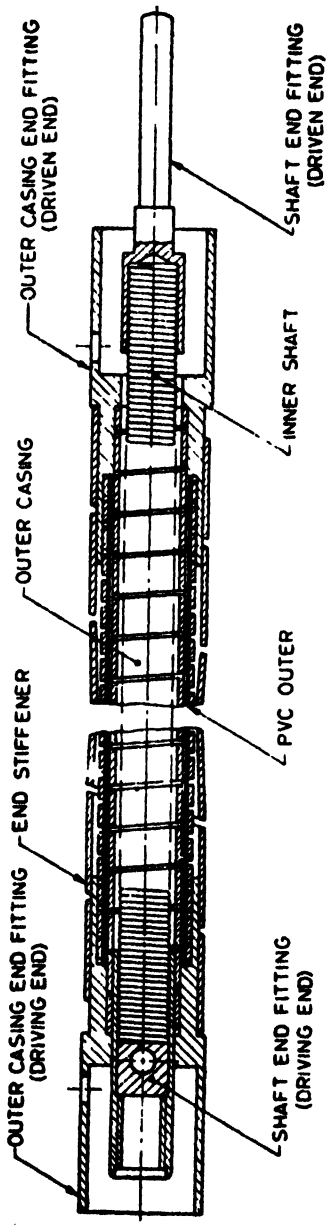
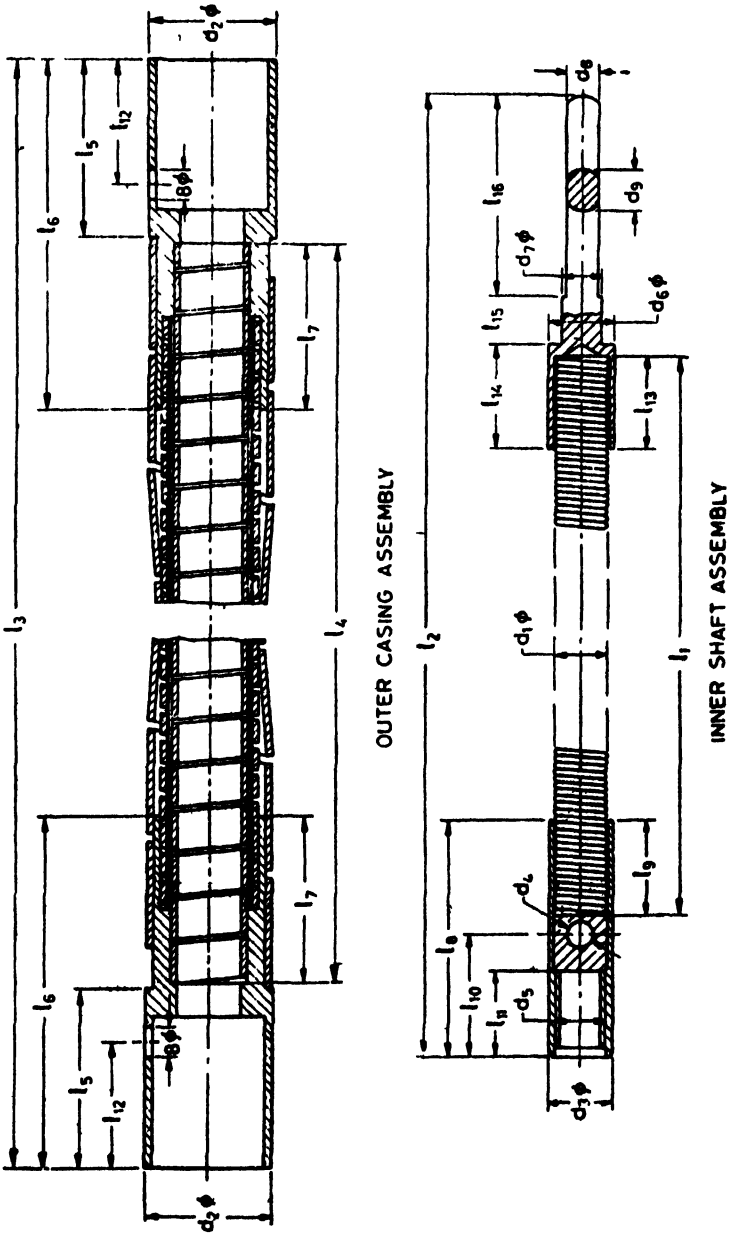


FIG. 1 FLEXIBLE SHAFT ASSEMBLY

TABLE 1 DIMENSIONS FOR FLEXIBLE SHAFTS

(Clause 4.1)

All dimensions in millimetres.



Designation	d_1	d_2	d_3	d_4	d_5	d_6	d_7	d_8	d_9	l_1	l_2	l_3	l_4	l_5	l_6	l_7	l_8	l_9	l_{10}	l_{11}	l_{12}	l_{13}	l_{14}	l_{15}	l_{16}
7×1 500	7	22	12·0	5	M10	8·5	5·0	3·9	7·5	1 500	1 590	1 547	1 463	30	75	33	40	11	24	18	20	15	20	18	38
7×2 000	7	22	12·0	5	M10	8·5	5·0	3·9	7·5	2 000	2 090	2 047	1 963	30	75	33	40	11	24	18	20	15	20	18	38
10×1 500	10	28	12·0	5	M10	12·0	7·5	5·9	7·5	1 500	1 605	1 548	1 448	40	90	40	47	15	25	18	28	20	23	18	52
10×2 000	10	28	12·0	5	M10	12·0	7·5	5·9	7·5	2 000	2 105	2 048	1 948	40	90	40	47	15	25	18	28	20	23	18	52
12×1 500	12	28	14·0	5	M10	14·0	7·5	5·9	11·0	1 500	1 607	1 550	1 450	40	95	40	50	18	25	18	28	25	30	18	52
12×2 000	12	28	14·0	5	M10	14·0	7·5	5·9	11·0	2 000	2 107	2 050	1 950	40	95	40	50	18	25	18	28	25	301	8	52
15×2 000	15	35	17·5	7	M14	17·5	11·0	8·9	11·0	2 000	2 109	2 059	1 959	50	95	45	64	26	33	23	34	25	28	13	55
15×3 000	15	35	17·5	7	M14	17·5	11·0	8·9	11·0	3 000	3 109	3 059	2 959	50	95	45	64	26	33	23	34	25	28	13	55
20×2 000	20	40	23·0	7	M14	—	—	—	—	2 000	2 086	2 110	1 960	43	110	35	73	30	33	23	27	—	—	—	—
20×3 000	20	40	23·0	7	M14	—	—	—	—	3 000	3 086	3 110	2 960	43	110	35	73	30	33	23	27	—	—	—	—

Note — The dimensions given for 20 mm shaft are for the type where the shaft has a threaded (fixed) connection at both sides and not sliding at the tool holder end.

IS : 4600 - 1968

5. DESIGNATION

5.1 Flexible shaft assembly shall be designated by the commonly known name, a letter 'L' or 'R' representing left lay or right lay of the outer layer of the inner shaft, by the diameter of the inner shaft, length of the inner shaft and the number of this standard.

Example:

A flexible shaft having left lay as the outer layer of the inner shaft with inner shaft diameter of 12 mm and length 2 000 mm shall be designated as:

Flexible Shaft L. 12 × 2 000 IS : 4600

6. TESTS

6.1 Visual Inspection — The shaft shall be inspected for obvious flaws, kinks, bends, looseness, etc.

6.2 Roll Test — A length of about 1 000 mm or more is taken, and is laid on the floor in a slight curve of about 10 metres diameter and rolled back and forth at the centre by foot. The shaft shall roll smoothly throughout its length without offering resistance and without jerking or flapping about. The extreme ends may flap a little.

6.3 Locking Diameter Test—The flexible shaft assembly is looped and the junction is held in hand. One end of the flexible shaft is pulled so as to reduce the diameter of the loop until the shaft assembly is felt to offer considerable resistance. The diameter of the loop is then measured. It shall be within 20 times the diameter of the inner shaft. The loop shall be as nearly circular as possible and there shall not be any obvious difference in the radius of curvature at two adjacent points.

7. MARKING

7.1 All shafts shall be marked with the manufacturer's name or trade-mark with designation of the shafts.

7.1.1 Flexible shafts may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

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AMENDMENT NO. 2 NOVEMBER 1980

TO

IS:4600-1968 SPECIFICATION FOR FLEXIBLE SHAFTS

Alterations

(*Page 4, clause 3.1, line 2*) - Substitute 'IS:4454(Part I)-1975*' *for* 'IS:727-1964*'.

(*Page 4, foot-note with* '*' *mark*) - Substitute the following for the existing foot-note:

'*Specification for cold formed springs : Part I Patented and cold drawn steel wires - unalloyed.'

(EDC 44)

Reprography Unit, ISI, New Delhi, India

AMENDMENT NO. 3 JULY 1985

TO

IS : 4600 - 1968 SPECIFICATION FOR FLEXIBLE SHAFTS

(*Page* 5, *Fig.* 1) — Delete 'PVC OUTER' from Fig. 1.

(*Page* 4, *clauses* **4** *and* **4.1**) — Substitute the following for the existing clause:

'**4. DIMENSIONS**

4.1 The dimensions of flexible shaft assembly covered in this standard are of two types, namely, Type A and Type B as given below.

4.1.1 *Type A* — Threaded shaft end fittings on both ends with the outer casing sliding at the driving end. The dimensions of Type A flexible shaft assembly and their parts shall be as given in Table 1.

4.1.2 *Type B* — Fixed outer casing end fittings on both ends and sliding shaft end fittings at the driven end. The dimensions of Type B flexible shaft assembly and their parts shall be as given in Table 2.'